TECHNICAL SESSION

Session 10: Ferries

Moderator: Richard Lolich, Maritime Administration

Good morning. Welcome to the non-plenary panel on ferries. My name is Richard Lolich and I am today's moderator. I am a Program Manager with the Office of Ports and Domestic Shipping with the U.S. Maritime Administration. The Maritime Administration has been an active member of the Interagency Committee for the MTS since its inception nearly two years ago. I also chair the ICMTS Subcommittee on Ferries which is composed of representatives from the Maritime Administration, the U.S. Coast Guard, Federal Highway Administration, Federal Transit Administration, the Bureau of Transportation Statistics, U.S. Customs, and the U.S. Army Corps of Engineers, who is our host here at the conference. I'm pleased also to have with me today two subcommittee members who have helped me in coordinating this panel, Michael Simack and Michael Gordon from the Maritime Administration.

During the past two days, we have heard a great deal about security, port capacity, freight capability, and the need to integrate all of our technology into RMTS. This morning, we will hear from a distinguished group of panelists on how technology and the marketplace are making a difference for the thousands of daily commuters who are either ferried to work instead of driving, or taking other modes of public transit.

The scope of ferry transportation in the United States is larger than most people think. There are currently about 225 operators serving 487 routes with about 677 vessels of all types and sizes. Each year, more than 113 million passengers and 32 million vehicles are carried by these ferries. In fact, ferries carry more than four times as many passengers annually as Amtrak. Ferries serve 43 states and territories of the U.S. These statistics were provided to us by the recently completed national ferry study which was mandated by the Transportation Equity Act for the 21st Century, more commonly known as TEA-21. In fact, we have copies and we have CD's of that actual study that are available here in the front if you want to pick up a copy on your way out today.

There are many challenges facing ferries and ferry operators in the U.S. including vessel wake and wash generation, vessel design and selection, financing for vessels and ferry infrastructure, and the critical role that ferries play in security and mobility in many of our large metropolitan areas, as demonstrated after the . . . . created earthquake in San Francisco in 1989 and most recently the New York City, following the tragic events of September 11th.

Our first panelist today is Captain Jim Bamberger. Captain Bamberger is going to talk to us about wake and wash generation, vessel selection, and the challenges facing those who operate high-speed vessels. Captain Bamberger is an accomplished marine professional with 23 years of experience as Chief Operation Officer, Port Captain, and Master for passenger vessel companies. He possesses in-depth knowledge of operations, regulations, and training requirements for

various ferry companies, including direct line harbor commuter service in New Jersey. Captain Bamberger has served as past President and Chief Operating Officer for Potomac River Jet, Inc., which was organized to initiate and provide waterborne passenger service on the Potomac River here in the Washington area. Captain Bamberger is currently Director of Business Development for the Maritime Institute of Technology and Graduate Studies near Baltimore.

Captain James Bamberger, Maritime Institute of Technology

"Vessel Wake and Other Issues Facing Ferry Operators"

Good morning. I'm going to try to keep this fairly brief because I know we are pressed for time. If it were another speaker, I would be happy to steal time from them, but since I'm competing with lunch, I think I'm going to lose that battle. So, I'll press onward.

First, I would like to talk about starting your vessel selection process and that begins with two unique tools that we have now that weren't quite available a short time ago, and that is model base and tank testing and in-water weight testing.

Tank testing models are a very good step in wake wash evaluation. Recent research at the Australian Maritime College's Ship Hydrodynamics Center in Tasmania, has resulted in what it describes as a very fair and direct method in which to compare the waves generated by one hull form against another, or many other existing hull forms. The technique requires controlled model tests within a deep and wide basin in which longitudinal wave cuts are obtained within a designated field. What I mean by a designated field is if you can see right here, what they do is they will take sections and these sections will be the same for different vessels and keeping the vessels at the same speed, they will be able to compare basically apples to apples. They will be able to take a cut here, or a window if you will, of a certain section of the wave pattern and compare that against other models or designs at varying speeds. So, they are comparing a similar piece, if you will, of the wave's signature to another vessel. They take cuts throughout the wave pattern but they can compare different pieces of that wave pattern to other vessels. In other words, 100 feet from the centerline of the vessel at maybe 300 feet after the boat, they can compare that section to another section so the results are fair and compare quite realistically to other vessels. These results provide an accurate and fair comparison of the performance of each vessel as specified vessel speed and distance from the vessel center line.

This type of testing can be used for the following: it can determine rational criteria for a specific location for a proposed vessel and vessel speed; it can be used to make direct and fair comparisons between competing designs; it can assist in determining whether a multi-hull is preferable to a mono-hull for a specific purpose, specific water depth or operating area; to investigate the effect a particular design has on waves generated – for example, the effect of increasing water line length or vessel displacement or non-displacement vessels have on creating wave patterns; and also to determine whether a vessel can truly be described as displaying low

wash characteristics. There are a lot of claims out there by various companies that they have a no wake or a low wake vessel, and this is a good first step – it is not the ultimate – determining what a wake signature is going to look like.

This is what is called a wavetector buoy. This was specifically designed to measure and record the wash generated by high speed vessels, especially in shallow water conditions. When I say shallow water, I mean harbor and river type conditions – 20-25 feet. Since its introduction a year ago, about a dozen of these units have been purchased. They are being used by harbor and river authorities, fast ferry builders and operators, and research organizations. The buoy are operated from a standing craft, connected to the standing craft by a floating cable connection, and data is recorded and observed via laptop computer. There is an underwater cable version of the wavetector available. It has just been developed and I'm not sure if it is in operation yet. But, this version can be moored semi-permanently at a point of interest in a river or harbor and that data can be transmitted to a landside facility, permitting continuous monitoring, and permitting monitoring during different weather and day conditions, daytime and nighttime.

This example is interesting because this will test a vessel once it is out there. It is a lot easier to get an idea of height using the wavetector than actually sitting in a boat observing. I should note that these models go for about $5,000 for the cable connected, and for the underwater cable version, I think it is about $8,000 - $10,000.

Next, I'm just going to look at – and there are so many of them – but at a couple typical examples of different high-speed hull forms. This is an interesting shot because this is a typical example of a bow wave generated – this is Boston Harbor Cruises – and you can see the difference in the catamaran in the foreground and a mono-hull in the background, and the difference in the bow wave generation between the two. Obviously, the mono-hull has a much larger and single-bow wave that is generated and contains a lot more energy. The catamaran has a much smaller bow wave and it contains a lot less energy, which is significant because wake is not just measured in height. I'll show some slides further which will give you a visual of this. But, wake and wash is measured in a couple different ways: its height, its frequency, its period of the waves, and the energy the waves develop. There is a lot of surface-effect ships out there that don't create a high wave, but create a roller-type wave with a significant amount of energy, and that becomes apparent once the wave gets into shallow water and hits the shoreline, but is not apparent in deeper water.

This is a typical z-bow configuration. The slides that we saw previously of the In-cat design show the z-bow or the extended bow at the waterline forward of the boat. This gives the vessel more waterline length which increases the economy, increases the speed, and lowers the wake. As we heard earlier, speed has a direct relation to waterline length, and by increasing the waterline length, you can increase the speed of the vessel. To that end, you can also see the reverse transom here in the rear which gives the vessel more waterline length. So, if you're looking at the deck of the boat, you are going from here to here, but when the traditional bow, you would lose waterline. Here you have increased waterline in the bow and the stern.

This shows a good example of a wake wash pattern from the stern of the boat. The typical cats will produce two different wave signatures – one will be the bow wave and the other is the wake

generated from the stern. Here you can see the bow wave generated here as it comes out, and much further, and this depends on the speed of the vessel, is the wake generated by the stern. Fast ferries are typically well beyond a dock or a beach by the time their wake or wave gets there. That is great for the operator because you can say that wasn't me – I'm five minutes down the river. But, in reality, this is what is happening. As boats go faster, the wake signature streams in a more vertical line or a more parallel line to the hull and takes longer to get to the shoreline.

This is a typical offshore ferry and I just put this in here to show that much deeper, much more wake, wake not a significant factor. I don't have the wake signature here, but you can see these operate well offshore and wake is not a factor as it is with inland craft. So, we can see with offshore operations that speed and cargo are the major factors and wake does not come into play as much, however, it still is a significant factor when it comes to shoreline erosion.

Another example of a typical In-cat, and this is a much better example of the z-bow configuration, as well as the reverse transom in the stern. You can see that the usable cargo space in the boat is really from here to about here, and this forward section is added for the wave piercer to stop vertical acceleration and act as basically a shock absorber. Then you see a real good example of the z-configuration of forward and the extended or reverse transom in the rear to increase waterline length to help with vessel speed.

This is an example of a really good non-displacement vessel. You can see here a real good example of where your cargo space is in the vessel, and then a long extended stern to give you increased waterline length and a reverse transom to even give you more waterline length. These vessels, being that they are not non-displacement creates, or being that they are displacement vessels, have a certain speed cut-off and are very effective in creating low wake in speeds up to about 20-25 knots. Once you go beyond that threshold, the displacement vessel is not as good or is not as practical in reducing wave heights as a displacement craft. These vessels do not get up on step. They don't plane. Therefore, they are constantly pushing that hull through the water and their critical speed as far as wake goes is, like I said, about 20-25 knots. However, at that speed they are very effective and very economical in that 20-25 knot range.

This is a surface effect ship and some of the downsides to surface effect ships are that they are not very maneuverable, they are noisy, they have high maintenance costs and they are sea-state sensitive. Roberta may remember this, but we did operate for a company called Direct Line a surface effect ship in New York Harbor. It ran from Pier 11 (the Wall Street area) to Laguardia Airport. The problems we had with it was it was very sensitive to wave height and sea state. If we would hit a tugboat wake or heavy waves, we would fall off the cushion. We would lose that air cushion and fall off the cushion and then have to bring it back up again. It is not very maneuverable – very noisy. Also, it throws not a typical v-type wave pattern. You can see it is really mostly spray coming off the bow wave, almost a non-existent bow wave, and not much in the way of a traditional stern wave, but a roller, which produces a huge amount of energy. We are finding this out as we are passing marinas and work barges in the East River. Visually there wasn't much wake at all, but when that wave energy, roller got to vessels or got into shallow water, it was doing a significant amount of damage. So, this vessel became not very practical to

run in that arena because it having to start up and slow down so much. It was a 45-knot boat but ended up averaging about 28-30 knots because it had to speed up and slow down so often.

This obviously is not a pleasure boat, but it is a good example of the effects of an air cushion or hovercraft. Even louder and less maneuverable than a surface effect ship, much more expensive to operate, very high maintenance costs, low passenger capacity. For the size of the vessel, the vessel has very low passenger carrying or weight carrying or cargo carrying capability for its size and its cost. It is very sensitive to sea state. You lose the air cushion with a significant sea state and you will fall off the cushion. You will notice here a huge amount of spray from the vessel, not maneuverable, doesn't turn well, and also even in the ideal condition with low waves, you do have an instance to get a cobblestone road, which is a bouncy ride, and you feel that even though the vessels is on cushion. So, it does have some applications, but it is not a very economic vessel to use for passenger carrying. I believe the hovercraft that run across the English Channel are being phased out of service, if they are not already out of service. Once those vessel do retire, I don't think they are going to be replaced by hovercraft.

This shows a really good example of a stern wake pattern. You can see the bow wave coming off here and you can see the extent to which it travels. It is not quite as visible as the stern wave, and doesn't have the white water or the height, but it has significant energy. Then obviously in a more parallel line of the vessel, the stern wake, which takes much longer to get to the shoreline, and does in most cases have less energy that the bow wave.

This next view is the same area but shows the comparison between a typical mono-hull which is here, and a multi-hull catamaran here. The major difference is the period and amount of waves. If you look at the amount of waves her on the cat, and then compare them to the amount in the same area of the mono-hull, you see a much greater number of waves with the mono-hull. I don't know if you can see it from where you are, but you also can see these waves that are perpendicular to the vessel or parallel to the transom that are rollers, and these contain quite a bit of energy and you don't see these with the catamaran. So, a catamaran in most cases for river and near coastal operations is the vessel of choice if you are looking at wake wash issues. If you are looking at sea state issues, the catamaran isn't quite as viable. But, for the inland routes, the river routes and the near coastal routes, a catamaran is a much better vessel in terms of lower wake wash production.

Recently, I was involved in a project to develop a high speed ferry service for the metropolitan Washington, D.C. called Potomac River Jet. While working on that project, we looked at and evaluated what we thought were most of the factors that I've discussed in the previous slides. We came up with what we thought was the perfect vessel for operation in the Potomac River, with its high population of pleasure craft, environmentally sensitive shoreline, and numerous geographical and operational restrictions. We did come up with a vessel that I'll talk about in a few minutes, but I see I'm getting hit for time. But, this is what I think is where the future of high speed ferries are going. This is a Caverna Mesa high speed tri-maran project. Obviously, this has military applications, but it does have commercial applications as well. It has a much higher speed and Bill will talk about this further with the Manja Onja project, but you can see that the bow wave here is captured by this hull and reduced. So, you don't have the traditional v-bow wave coming off the bow. That bow wave is captured in this hull and dispersed to an extent

and then delivered to the stern. It does still have some energy, but it doesn't quite have the same amount or same affect as the traditional.

Just to go through these real quickly – the future of high speed ferries is in training. At the Maritime Institute of Technology where I am currently working, we have a bridge training simulator training for high speed craft. This enables someone to practice what could take them a lifetime in different operating scenarios on the bridge of a high speed ferry with visuals and the same equipment they would use if they were operating their existing ferry. We can even use the exact equipment and the exact bridge layout. These simulators are module and we can configure them to individual high-speed craft so that captains and crew can train on their own vessel in a simulator, look at all different conditions and operating areas before they actually or while they are actually on operating craft.

So, I know I'm pressed for time so I'm going to cut it off there. Thank you.

Lolich – Thank you, Captain Bamberger. Captain Bamberger has shown us how to design or how to select the right vessel design for the are that we're going to serve. But, how do we finance that vessel? How do we pay for it? Our next speaker is Clayton Cook. Clay Cook is counsel to the Washington, D.C.-based law firm of Bastanelli, Brown & Kelly, and a partner in the New York headquartered chartering consulting firm Management and Transportation Associates, Inc. He advises vessel owners, financing sources and law firms in structuring and implementing transactions involving the construction, ownership and financing of vessels engaged in the U.S. domestic trades and the availability of various U.S. government financing guarantee tax-deferred and other promotional programs. Recent client engagements have included U.S. vessel owners involved in existing and start-up passenger ferry operations, and U.S. shipyards involved in the construction of passenger ferries and so-called fast ferries, where Mr. Cook has assisted these clients in accessing the Ferry Assistance Programs administered by the U.S. Department of Transportation Agencies.

Clayton Cook, Jr., Management and Transportation Associates

"Challenge and Opportunities in Financing Ferry Boats and Operations"

Good morning. I have a paper and I don't have a slide show. Copies of the paper are in a box down here in front and you can help yourselves to those. There are plenty to go around when we break for lunch.

We've all heard, and indeed all of us knew before we came here, about the need to shift to water mode for passenger and freight transportation. For the last half-dozen years, my principal professional involvements have been engagements to help existing ferry operators or proposed start-up operations access financing means to put ideas into place to deal with terminal needs,

ferry boat needs, and in some cases, to refinance existing fleets, and in most cases, for new buildings.

This morning, I want to touch upon four programs that are administration by the Department of Transportation and then deal in a little more detail with respect to a couple of those programs, and talk about how they might be used in combination and speculate a little bit about what the future may hold.

I'm going to make the presentation reasonably short. The paper is longer and we all hope here on this panel that we are going to finish up in a fashion that there will be time for some good question and answer exchanges.

U.S. DOT has four programs which deserve mention here this morning. Two of them are administered by the Maritime Administration, and these are administered really by the Maritime Administration essentially standing alone, so they can be accessed through contacts with MARAD. Two of the programs are under Federal Highway Administration jurisdiction. Those programs require accessing U.S. DOT and dealing with state DOT authorities and generally regional and local planning authorities.

The Maritime Administration programs are designed to assist in the construction and financing of vessels. They date back historically to the Merchant Marine Act of 1936, amendments to that Act in 1938, and further amendments in 1970 and in 1972. The most important of the MARAD programs, the so-called Title 11 guaranteed financing, allows a ferry vessel owner to finance 87.5% of the costs of a new ferry vessel over a 25-year period at a coupon rate which, if you went to the market today, would probably be in the neighborhood of 5.25%. Just for comparison, let's realize that if that same owner attempted to finance that vessel after delivery with a commercial source, they would be looking at 8-10 year financing with a rate of probably 8-9%. The difference in cash flow requirements in those financing modes is, to say the very least, dramatic. If you are in a start-up mode, it is a big help not to have those cash demands. If you are in a fleet expansion mode and want to build more vessels and expand your business, it is a great help not to have to finance what are 20-25 year assets over an 8-10 year term. It makes much more business sense, sense for the national government with a policy of encouraging ferry transportation, to allow asset financing over the life of the asset, or something approximating that, rather than a figure which is perhaps one-third or only one-half of the life of the asset.

That program involves the issuance of bonds by the vessel owner, the sale of the bonds to the public, but the guarantee by the Maritime Administration of the full faith in credit of the United States government with to the repayment of the indebtedness which the bonds evidence. For the vessel owner, it is really like buying an insurance policy – the vessel owner pays the Maritime Administration a guarantee fee, which enables the bond holder in the event the vessel owner defaults, to go directly to the federal government and be repaid. Because of that, the debt sells at essentially a comparable treasury rate plus 80-100 basis points. That is why when I stand here this morning, I can say that 5.25% instead of 8-9% and why I can say that people are willing to buy bonds that go out to 25 years rather than limit these transactions to an 8-10 year financing life.

The second program which MARAD administers, and which is much more restricted in its availability, is the so-called Title 6 Capital Construction Fund program. That allows a ferry operator to set aside current earnings and take a 100% deduction from taxable income, and generally that will be a deduction from state as well as federal income, and set that money aside for the construction of new vessels. It is a program that is entered into under a contract with the Maritime Administration. One sits down with the Maritime Administration and talks about ones future plans for fleet expansion, agrees upon a schedule, and then executes a contract which guarantees the deductibility of the set-asides. That program is limited in its application to Alaska, Hawaii, the U.S. Great Lakes, and Puerto Rico.

The two programs that are administered by the Federal Highway Administration are administered now under TEA-21 and involve the ferry boat set-asides with an authorization of $220 million over the six-year life of TEA-21, and the SEAMAC program with a total authorization of $8.1 billion over that same period. These programs are, for the most part, useful not for vessels in practical terms, but for the bricks and mortar of terminal facilities, although they can be used for operating subsidies during start-up of vessel operations and other purposes.

The Ferry Boat Discretionary Fund looks, I'm afraid, probably much better than it is. First, we're only talk about $220 million over six years. Secondly, most of that money has been earmarked in the course of the legislative process. So, if you haven't been involved and haven't been in there and your members have not taken care of you at this point in time, there is very little money left.

SEAMAC, on the other hand, is an entirely different story. There are ample SEAMAC funds available. Most ferry terminal facilities are going to be located in operations that are non-attainment locations. Given that, working with U.S. DOT and with your state DOT and your regional and local planning authorities, those funds can be accessed for terminal construction and the other hard infrastructure that is necessary for an integrated ferry operation.

In my work over the last half-dozen years, the most successful of the operations that I've dealt with combined these programs in the fashion that I've already suggested they should be applied. They have been used by an existing ferry operator to refinance a portion of its fleet to take it from 8-10 year financing out to 25-year financing in conjunction with the construction of new vessels.

ISTEA was used by the same ferry operator to obtain planning funds for a new terminal, and after the passage of TEA-21, those provisions were used by the operator to enter into an agreement that allowed the construction of a large, new terminal facility for its use and the use of other ferry operators which would be located on land which that operator donated to the state government and which that operator then managed under a long-term management contract. So, in using these programs in combination, this operator was able to renew and expand its fleet and put in place state-of-the-art new transportation facilities without ever going to Chase Manhattan Bank or the Bank of America. This was all done with U.S. DOT, state DOT, regional planning authorities, and so on.

There has been a lot of talk about public/private partnership modes, and that really is what I've just laid out on the table for you here. Obviously, there are lots of combinations and permutations. There are as many as one can imagine different ways of doing things, but U.S. DOT has good programs in place and as long as they receive adequate funding, they are there, available, and provide the basis for sound financing plans for existing or new ferry operations.

There are a lot of opportunities for ferry construction. There are a number of U.S. shipyards that are good yards prepared to build ferries in the 30-40-50 knot range. There is a need and the U.S. DOT has some good programs.

Thanks very much.

Lolich – I guess the financing opportunities that are provided under Title 11 are certainly very attractive. Although they are not the zero percent financing like the major auto manufacturers are offering, but it still sounds like a good deal to me.

Captain Bamberger earlier talked about the challenge facing ferry vessel design, namely wake and wash generation. This has been a challenge that has been out there for many years. Chuck Robinson and Bill Burns, who are with us today, collaborated and co-founded a group called Mangia Onda, which in Italian means Wave Eater. They have come up with a hull design which they believe answers that question and solves that problem. Bill will talk to us about that.

He offers a unique blend of creative design, naval engineering and business experience to the Mangia Onda project. He has been involved with the development of innovative concepts for a diverse range of organizations, including the U.S. Naval Research Lab, Scripts Institute of Oceanography, Dyna Yacht and Americas Cup Syndicates. In 1992 and 1995, Bill was a key member of Team Dennise Connor's Americas Cup Campaign and was responsible for hull and appendage development programs, including the radical tandem keel design. Mr. Burns is a member of the Society of Naval Architects and Marine Engineers and the American Boat and Yacht Council. He holds degrees in Mathematics, Engineering and Business.

Bill Burns, Mangia Onda Company

"Ferry Vessel Design Which Creates Little or No Wake"

Good morning everyone. Before I tell you about the m-hull and describe how the hull works, I would like to give you a little background on why we started looking at low wash ferries and it really all begins in Venice, Italy. If you're familiar with Venice, the city is built on the water. The only way to get out and around and get through it is by boat. For centuries, vessels have been moving through Venice, creating waves. These waves, over time, have slowly eaten away at the foundations of the buildings and they have already started to fall down. Chuck Robinson was approached in 1998 by ACTV, which is the Water Transportation Authority in Venice, to see if he could come up with a design to help solve this wave erosion problem. He came to me and he invited me to join with him in the creation of a company called the Mangia Onda Company, with the sole purpose of trying to find a solution to this problem – low wash.

So, we began testing many different types of hulls and we fine-tuned the design and came up with one that we thought would work very well, and we put it on a 23-foot prototype water taxi which we delivered to Venice. What we found was not only did we have a boat that had a very low wash, but it was also very efficient. When you think about it, it is intuitive that a boat that has low wash and doesn't create many waves is going to be very efficient. Based on the performance of this boat, ACTV asked us to build a 65-foot, 150 passenger vessel. We did that in San Diego last year. You can see it here. It was built in San Diego by Knight and Carver Yacht Center. They built the boat out of fiberglass and it was powered by two Cummings 210 HP engines. We were able to get over 20-knots with this vessel, light ship, which is remarkable. Based on that performance, we went to the Maritime Administration and demonstrated how the boat was performing. They became very excited and asked us to explore the high-speed potential of the boat. This boat was designed for operations in the lagoons of Venice, which have a speed limit and they are also very sensitive to shoreline erosion. So, the Maritime Administration encouraged us to go ahead and look at what we could do at high speeds for the ferry market, and that is exactly what we are doing today.

This is a diagram that shows different types of hull forms. Jim alluded to it earlier as well as Marc Stanley from Bollinger, talking about the different types of hull forms. What makes the m-hull unique is it transcends these different hull forms. It is not exclusively a displacement vessel. It is not exclusively a planning vessel, and it is not exclusively a surface effect. But, rather, it combines all the best elements of those types of boats into one hull form. So, now we have the opportunity to design a boat which can smoothly transition from a displacement boat to a planning boat, to a surface effect boat, depending on operating conditions.

This is a schematic which shows the basic m-hull shape. You can see the central displacement hull in the middle, the planning tunnels on either side, and then the skirts. These are the three fundamental elements of the m-hull.

The central displacement hull provides the static support for the vessel. It is the backbone for the boat. It allows the boat to carry a heavy load and also allows it to tolerate being overloaded or shifting the ECG. The basic geometry is a streamlined body. It has a fine entry, fairly deep bow, and then it runs out to a shallow, broad transom which helps reduce the overall wash.

This diagram shows the planning tunnels and these are key for providing the hydrodynamic and the aerodynamic lift. Their basic geometry is elevated at the bow and it swoops down toward the waterline after mid-ship, where it goes out horizontally. What is neat about the planning tunnels is they can be designed independently of the central displacement hull, which means that we can now optimize their geometry and form to provide planning lift without having to compromise the central displacement hull. They are also very important for aerating the water. When the bow wave is captured in the tunnel, we mix air in with that water, and that water/air mixture underneath the boat creates a low viscous, bounty layer or air cushion which allows the boat to more efficiently go through the water. It is also key in helping reduce the wash of the stern wave that comes off the boat, because when that air escapes off the back of the boat, it actually dampens out some of the energy in the stern wave.

Then finally, the skirts – they are on the outside of the vessel and they are important for containing the bow wave and transitioning some of that bow wave energy into vertical lift. They also are important for surface effect. At higher speeds, these skirts help contain the air in the tunnel and provide an aerodynamic lift or aerodynamic planning. Finally, they provide additional stability, both dynamic and static: dynamic because the boat is moving quickly and it is capturing the air, do in a turn or any kind of aggressive move, the water actually acts as a damper or ride-control device.

So, all of these elements come together in this one hull form – the m-hull. It works automatically. It is inherent. You don't have to worry about certain settings or whether the operator is doing something correctly. It all happens naturally. This diagram illustrates what is going on fairly well. You can see the bow wave curling down the channel, contained by the skirt, capturing the air as it is forced underneath the boat. That air provides a cushion which is low viscosity and when it comes off the back of the boat, it helps absorb some of the transom wave.

Here it is in action. You can see the central displacement hull putting up this wave which is captured by the tunnel. You will notice that there is very little bow wave coming off the boat at all. This is about 20-knots in San Diego, California. In this picture it is hard to see, but there is a ribbon of foam behind the boat and very little height in that stern wave.

So, what are we doing now? We are exploring the potential of the design. We have a 38-foot test vessel in San Diego. We have already proven high-speed potential. We have been able to get up over 50 knots with less than 500 hp. On this boat, we just put an outboard on the back of the boat. The boat is out of the water right now. We are doing some modifications to the hull to help improve the shock mitigation. We should have the boat back in the water by the end of the year. Once we get the boat back in the water, we want to quantify for the industry wake measurement, shock mitigation and load sensitivity. In moving loads around if we want to get into larger vessels, this is a good opportunity for us to evaluate how big we can go.

In the meantime, we want to get some boats on the water, so we are looking at a 38-foot patrol boat that you see here. This boat would be ideal for any kind of inland operations where wash is a problem and efficiency is always a problem. This boat could cruise through an anchorage at 30-40-50 knots without disturbing the people there, and it would also be ideal for operating in shorelines where there is some sensitivity to waves.

In the future, we are also looking at military applications for the design. You can see a couple different concepts here. One is the 38-foot . . . . This would be an 11-meter vessel. We are talking with Special Forces about this type of special insertion vessel, and we believe there is some shock mitigation features on the design which could benefit this type of operation.

We are also looking at combining some m-hulls together so we create a very broad boat. We are excited about this opportunity for surface effect. We think by putting m-hulls together, 2-3-4 together, we can create a vessel that is a surface effect boat, but will operate very safely, it still has the inherent displacement hull and the planning parts of the hull. So, it would still operate in adverse sea conditions as Jim mentioned earlier today.

For bigger vessels, we are exploring missile ships.

Finally, where it all started – fast ferries. We want to take advantage of what we have done over in Italy and design and build some boats for the U.S. market. You can see a couple of them here. We are incorporating both the single and the double m-hull.

So, to wrap it up – we are excited about the m-hull. We have seen a lot of potential for the design. We expect to quantify the performance, characteristics of the boat, and of the design by the first quarter of next year, and we are excited about getting some boats out on the water by the end of next year.

Thank you.

Lolich – Thank you, Bill. Most of our discussion today is centered around passenger ferries, but as we all know, ferries can and do carry cargo as well. Our next speaker is Dr. Roberta Weisbrod who will talk to us about fast ferry transport in the New York area, both pre- and post-September 11th. Dr. Weisbrod began her career as a lecturer in molecular cell and chemical biology at Columbia University. That, in turn, led to a position as Special Assistant to the Commissioner . . . . where she coordinated projects with other major transportation and freight movement projects in the metropolitan New York area. Dr. Weisbrod also became a principal in Partnership for Sustainable Ports, a consulting group which advises clients on port, waterfront development, and freight transport projects. Dr. Weisbrod holds a PhD in Biochemistry from Cornell Medical College, and is well versed in the myriad environmental issues facing ferries and ferry operators.

Roberta Weisbrod, Partnership for Sustainable Ports

"Pre- and Post-September 11th Impact/Importance of Ferry Transportation in the New York Area and Technological Needs from the Customer's View"

I think because I am the person that is holding a bunch of people from lunch, I'm going to get quickly to the bottom line and I'm very pleased that Paul Bea quoted Secretary Manetta. What I want to do today is present evidence that Secretary Manetta's vision that he presented at the MTS meeting in May of using maritime transport, especially freight ferries to relieve urban congestion, is beginning to be realized in New York Harbor and that this presents fruitful opportunities not only for research, but for business.

First, what I want to do is talk about the background of maritime freight transport in New York Harbor. After he spoke, I began to be very sensitized to what was happening – something I wanted to see happen. I started realizing in putting all the projects together that there was well over $100 million and upwards of about $200 million in spent or committed investments in both

the public and the private sector for maritime transport in New York Harbor, both intra-harbor, and as you heard before, the port inland distribution network. That port and distribution network I don't know how much they are spending. I know how much might have been spent. I didn't even include that in the $100 million.

Most of the action is in rail floats and those are deck-covered barges with rail track that can handle 15 railcars. Oddly enough, much of the action – 100 years ago, all the captains of industry, Commander Vanderbilt and Jay Gould were knocking heads to capture that business and there were something like 3,000 railcars per day. Now there are about 3,300 railcars per year. But, the business is growing 20%. SEC quarterly reports are very high. They look like they are going to continue to grow. The City invested $20 million to upgrade additional rail float landings to what is existing. The one that they just recently invested in connects to the Bay Ridge line, which goes all the way out to Long Island and connects with New England. So, they really think this will happen.

The City also retained Moffitt & Nichols to develop two other rail float landings. One more – CP Rail, as all of us have seen in recent talks, are very aggressive about capturing business in this country, was awarded the concession at 65th Street which connects to the Bay Ridge line. So, they take it serious and they had to compete hotly for that.

Finally, the Cross-Harbor Railroad that handles the floats is now more professionalized, for anyone who has followed the story. It is proposing two new services – container on flat car, in addition to the old-fashioned box car hoppers and tankers, as well as truck trailer on flat car from New Jersey to New York to avoid that urban congestion and go out to the island. There are additional investments which I didn't count in this compilation for an intermodal yard on Long Island that would nail down that service. So, that looks good.

There is also container on barge service in Redhook, Brooklyn which his the cocoa capital of the United States. Ships come in from Africa. They also have containers. The containers are floated over. The Port Authority just invested additional sums – some would say subsidies, to keep that service going. But, it could have multiple uses even with the PIDN.

Bulk barges – 75% of the harbor movements in New York Harbor are barge for oil and gravel and construction material and debris. New information – waste management has just invested, or is planning to invest if everything goes through - $50 million to transport New York City's garbage – now that Freshkills Landfill is closed – from five stations in the City to Linden, New Jersey. That has spurred Linden, New Jersey and the County of Union to consider a whole intermodal freight, high-value area called a global freight village. So, again, there is a lot happening.

Coastwise trade – trailer bridge, which goes from Puerto Rico to Newark – I call it their express service as opposed to another company that goes coastwise – trailers three-high. What is new there is that they have just invested and Jim Corbit is talking about this in another room, they've just invested in using distillate fuels instead of residual fuels. So, they believe in their service and they are attempting to be environmentally sound and selling the service on that basis.

Columbia Coastal does local service between New York Harbor and Boston and Philadelphia and Baltimore, as well as other, what I'll call, local service. They may be awarded the PIDN contract.

Of what is planned, you heard about the port inland distribution network, and I will talk about freight ferries. There are two services that are being proposed. One has been proposed overtly, and one is very quiet, and I'm working on the quiet one, which I will speak about. The one that has been proposed is Empire Water link which would connect JFK Airport on Jamaica Bay – very sensitive and they would look to the people who handle wakes – very important – to Newark Airport. This trip, if there were not traffic, could take an hour, but ordinarily takes 2-3 hours, and sometimes even more. So, they feel there is a real market for that service. In the first instance, they are going to go into passengers between New Jersey coastal communities to JFK. The Port Authority just awarded them an option on a lease at Bergen Basin, right over the fence from JFK, and it is contingent on getting environmental approvals.

So, that is the background. All this I put together before September 11th. What happened then?

What happened was enormous chaos, confusion. The path was destroyed downtown. Subway lines were destroyed, were not working. Verizon, right next to the World Trade Center, phone systems went down. Cell phones went down. Utilities were down. Streets were impassable to bus and cars. The choices were walk or go by water. Luckily, there was one bridge that had been closed for nearly 30 years to pedestrians and had just been opened – that was used by tens of thousands of people. The ash and the debris got so bad that as people ran to the edges of the island to get away from it, some people actually threw themselves into the water to avoid it. Furthermore, fire hydrants were destroyed, there was burning. Fire trucks were destroyed – in fact, $4.0 million worth of fire trucks. So, what happened?

Right away, the maritime sector, every single aspect from the private ferries to personal yachts to cruise ships to tugboats, all ran and rescued people. There is a history of what happened that day in terms of the maritime by one of the historians at the Seaport Museum who is collecting all this – Norman Bowers. Many of us have been working with him. So, the story isn't fully there, but let me give you a few statistics. New York waterway, with its 23 boats, which usually by 9:00 have stopped running except on the days when they have tourist traffic, and Mondays and Tuesdays were not those days I contracted with them – 23 boats. They put them all into service and in the first day, instead of 36,000 passengers, they had 160,000. A week later, they had picked up one million people. They were going around the clock. Everything was picking up people.

Let me talk about some of the other things that happened. Fire suppression – one of the first vessels on the scene was an antique fire boat that had been out of service for a few decades and was there to do ceremonial water displays and to teach people about the harbor. It was right in the park not too far from downtown where everything happened. They immediately rescued, with great difficulty because they weren't set up to do it, 150 people, and set up a triage. The next run in, they were asked to put out the fire, and they are one of the biggest. They are antique. The newer boats had smaller capacity and you really needed a large capacity vessel. They take harbor water and jump pump it out, and they again worked around the clock. They were also

involved in rescue operations because there was no land-based ways – in fact, the head of the maritime sector was buried in ash and the only way to get to him was through fire boat to land and then go inland – they couldn't go the other way.

Medical and other supplies were transported. Doctors were transported. That story of how goods were transported really changed the way most of us thought. The unloading of goods was by bucket brigade. On each shore, 300 people would go hand-by-hand with cartons of goods and there was that sense of "where there is a will, there is a way", and let's see how we can figure out things.

Mortuary – food – the cruise vessels became restaurants because they had working utilities. They had electricity. They could cook. Debris removal became extraordinarily important. There are millions of tons of debris that had to be removed and it had to be removed so barges, taken to the landfill, for the FBI to actually plow through the debris to look for evidence.

Passenger transport – I mentioned and I will also include the fact that the National Guard was now . . . . . in Governor's Island which the Coast Guard had left and the National Guard is here and were brought back and forth by ferries.

September 11th actually had another impact, and that was that it made ideas that were hanging around suddenly feasible. One of them is the water taxi. The water taxi is a service that handles from 50 –100 people and would go to a number of sites in lower Manhattan, and in fact from mid-town, the business districts of Manhattan and connect them by water as well as downtown Brooklyn. That service had been tried about 2-3 years ago using vessels that were not purpose-filled but were brought up from Florida. They couldn't handle the strong current. The developer, Tom Fox, was looking for funding. After September 11, he got funding from one of our prominent real estate developers, Douglas Dirst, who also has a fuel cell building in New York Harbor. Freight ferries also became more feasible.

So, what are freight ferries? Water transport of high value, time-sensitive, air cargo. The drivers of that service are the same drivers that drove all of the marine freight transport in New York Harbor. The enormous congestion and the related incidents of closures, accidents, and incidents which have only accelerated since 09/11. Many of you know, Monday there was a lock-down of New York Harbor. It did not impact the air cargo delivery service which because I'm working with one of the major air cargo companies in the United States, and in fact, the world, as well a private real estate developer, they have already gotten their goods to the sorting facility in lower Manhattan. It didn't impact them, but certainly they knew that yet again this is a really serious issue. We began working on the issue in the spring. We developed certain models. But, let me give you a few of the constraints of what are the challenges to make this happen. It is not money so much. It is not wake so much. But, what are the constraints and what are the technologies and what do we have to develop, and where are the commercial opportunities and research opportunities.

The constraints are three. There are very narrow time windows for air cargo pick-up and delivery. This would be a service from Newark Airport directly to downtown Manhattan. This service, during the rush hour when the planes come in from 6:00 to 7:20, is a very high rush

hour, but the planes can't come any earlier and the pick-up can't be delayed. This is a very narrow timeframe in order to make the commitment of the 10:00 office delivery. There are diseconomies of scale for that reason. Every time I spoke to (and I spoke to about a dozen vessel providers), they said, why can't you use a bigger vessel. No, we can only use vessels sized because of the flow of how the sorting takes place as a continuous flow, and the vessels could only be sized for two truckloads – otherwise, it didn't work. You couldn't surge it and you couldn't wait and then get it out there.

Finally, the critical issue, and the one I'm going to focus on and one that Keith Seaman mentioned on Wednesday and I think many of us are thinking about is that inter-operability between air and land and sea, and how do you make that happen in an arena that is incredibly sensitive? What I didn't know about air cargo containers is that they all look different – they do look sort of fragile. But, if they are dented, the FAA – and in any way – it is not like a sea container, aluminum container, easily dented – if they are in any way modified, the FAA will not allow them to be used on the plane for danger of movement within the plane. So, you have containers that are not standardized in shape, are very sensitive in terms of the handling, and you have a business model that you have to relate to.

So, how did we actually approach the issue. The first big question – we are going from Newark Airport over here and we have to get to lower Manhattan. So, there are two ways of going and one was to go this way. That was the way we initially thought and we requested 35-knot vessels that could do the trip in about a half-hour. That made a lot of sense. Then the question was – do we do trucks roll-on or air cargo containers. Obviously, trucks are twice the weight, better to do air cargo containers. In our analysis, I want to acknowledge the really fine work and I evaluated several models that National Ports and Waterways Institute hooked together, their fast ferry models of what is the cost and how do we compare costs of different kinds of vessels and business models. So, that was very useful. Fuel is the major cost.

The other model is containers. We cannot do low-low and we cannot to low-low for a number of reasons. First, even when I did evaluate the labor issue, and it is not the labor issue and the fear of the longshoremen. There is the issue of the sensitivity of the container. There is the issue of an investment in yet another piece of equipment that would just add enormously to the cost. Another labor cost best to use what I would have to call a "po-po", a push-on/push-off. That is what actually happens between airplane and truck. There are scissor lifts that adjust to the height of the plane and then workers push the 5,500 pound average weight containers on exquisitely flat rollered plates, onto the truck, and then the truck goes on its merry way, taking a enormous amount of time, far longer than it needs to, to cross the harbor.

So, we wanted to be able to use a push-on/push-off and that is the real quest. How do we get a push-on/push-off between truck and vessels knowing that the piers are about 10 feet above the waterline. The waterline varies with the tide of approximately five feet, sometimes six feet on average.

After 09/11, our thoughts actually crystallized about how we would use the service. We thought a better way to do the operation would be to go from Newark Airport across the Bayonne Peninsula, and then from somewhere on the Bayonne Peninsula, then take a vessel a mile or so

across the Hudson River. So, limit the trip of the water. This would be cheaper. The vessel would be cheaper. It wouldn't have to go as fast. And, wake actually was not going to be as much of a problem. With that 35-knot vessel, the fastest we could go through the Kilvan . . . three and one-half miles was 25 knots. With a purpose-built vessel, that would really meet that very tight requirement that the Coast Guard makes. So, now we could go the shorter water route, slower vessel. We still need that quick on-off of the containers. So, we have a number of constraints – sensitive containers. We need to get them on and off by human power either directly or with a winch because we can't load. And, once we solve that problem, I think there will be – this is in some ways the low-hanging fruit of freight ferries. It was tried in Hong Kong's . . . . . They didn't have the volume. It is going to be used in San Francisco, but they are using hovercraft. But, New York Harbor, I think the challenge will be resolved. There will be enormous commercial benefits. There is a very interesting research issue which I have hope I presented and that someone will step up to the plate.

In conclusion, I want to say that I'm very high about looking to the private sector to really help achieve that vision that Secretary Manetta has brought to all of us. So, thank you very much.

Lolich – Thank you, Roberta. I notice from our watch that it is lunchtime, but if anyone has a question perhaps one or two, the panelists might take some questions. Any questions?

Question – I have a question that relates to creative financing. Clay, I heard you mention the particular experience you had with the successful case where they combined financing. From an institutional standpoint, with the DOT or even with creative financing with the private partnerships, would you have any idea as to how we could facilitate, within DOT, what I would call intermodal financing, but from the standpoint of developing some sort of flexible structure between the modes to provide that kind of a venue.

Cook – I suppose there really is no reason why the Maritime Administration and Federal Highway could not work together to develop a model. I think both agencies really have depended upon the private sector party coming in to seek assistance. There is an applications process and people come in and apply. Certainly, when people come in and apply to the Maritime Administration for vessel financing, MARAD could give them some direction in terms of SEAMAC monies that would be available for terminal construction. I suppose I view that private public arrangement where the bricks and mortar and terminaling is paid for by the public sector, and the vessel transport is left to the private sector, as in many ways an ideal mode. I think to get regional and local planning authorities and state DOT's to spend money for something it is probably easier if they can point to a terminal that they built than if they have to talk about vessels that are being run.

I think on the vessel side, the MARAD program, with its 25-year financing, is an ideal financing mode for vessels and what we have seen is that using that partnership, you've been able to operate the ferry without operating subsidy. So, it reduces or eliminates the need for any operating subsidy. It keeps the government out of the operating subsidy business and out of the intrusive reviews of the financials of the operator, and it lets the operator determine fees based upon supply and demand. But, I think it is an internal business with MARAD and Federal

Highway perhaps working together and assisting people when they come in. I'm not sure that is a very good answer.

Question – The only other thing I would like to make a comment on is that in urban metropolitan areas, you have a lot of creative financing that happens within the private sector, and in many cases, packaged together with partnerships with the private and the public sector. I guess if ferries are going to be a new development in the urban metropolitan areas, I think there has to be a better recognition of how the ferry development piece fits within the overall structure of waterfront redevelopment. At least from the standpoint from the municipalities and even regions, they do have plans for waterfront development. Often times it can be an institutional constraint that would prohibit a ferry development from occurring because it is not allowable under land use regulation. So, this is more of an observation I'm making – there is an interface between the package deals that are being made for urban waterfront redevelopment along with say ferry developments that would operate more or less as an individual initiative.

Cook – Let me just respond very quickly. I think that in many of the ferry planning projects that are underway, the municipality is assuming that it is going to have to provide the vessels as well as the terminal infrastructure. I think that is an assumption that really ought to be challenged. I think it would be ideal if we could get some vessel lessor financing available to either lease ferry vessels to the municipality, or to lease ferry vessels to an operator who would operate under contract with the municipality. I think of the situation in the San Francisco Bay area and I suppose two years ago I would have said that California has lots of money – they can do the whole thing. But, sitting here in November of 2001, I'm not sure that California has enough money to do the whole thing, and that project could probably be moved along much more rapidly if they would look at the vessel financing as potentially private sector apart from the terminaling.

Lolich – I would like to thank all of our panelists for participating today and would like to call your attention to the fact that copies of Mr. Cook's presentation are here at the front and we also have CD's of the recently released national ferry study as well. Thank you very much.